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REMEDIAL INVESTIGATION
S and A Data/Chain of Custody

SEAVIEW SQUARE MALL

SUMMARY OF AIR SAMPLING

Prepared By:

Fred C. Hart Associates, Inc.
530 Fifth Avenue
New York, NY 10036

Prepared For:

Equitable Real Estate Management Co., Inc.
101 Park Avenue
New York, NY 10178

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SUMMARY OF AIR SAMPLING

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1.0 Introduction

This document summarizes gas sampling performed at Seaview Square Mall. The sampling is broken down into investigations performed during three different periods. The first was part of the Remedial Investigation performed at the site. The second was the the Phase I and Phase II sampling program initiated to better define the results of the Remedial Investigation. The most recent sampling performed is the Phase III investigation, which was a detailed sampling program focused on areas where gas had been detected in previous surveys.

2.0 Survey Equipment

In general, two survey instruments were used to detect Landfill Gas (LFG) at the mall: The Century Organic Vapor Analyzer (OVA) 128 and the MSA Explosimeter. A third method, Draeger Colorometric tubes, was used during screening procedures during the Remedial Investigation.

The OVA is used to detect LFG in the 1 part per million (ppm) to 1,000 ppm range, and to detect and quantify volatile toxics. The OVA 128 analyzer uses a flame ionization detector for monitoring total organic vapors. Pure hydrogen is burned with air in this detector. The hydrogen flame ionizes molecules of organic vapor present in the air, the these ions are collected by an electrode. The current generated is proportional to the concentration of vapor in the air brought to the detector. Different organic compounds ionize to different but repeatable extents in the flame. Therefore, the response of the OVA for any given compound is expressed relative to a standard (methane).

The OVA can be operated in two modes: the Gas Chromatograph (GC) mode and the survey mode. In the GC mode, the OVA can provide quantitative analysis of the individual components of the sample. The OVA 128 is equipped with a chromatographic column and a sampling valve for direct injection of gaseous samples into the column. A chart recorder is used to record the chromatograph of the emission components as they exit the column. In the survey mode (SM), the OVA 128 analyzes any given compound in the LFG and reports the cumulative total amount in ppm.

The MSA Explosimeter is used to determine whether the LFG sampled is greater or lower than the lower explosive limit for methane. The explosive potential of the gases is measured as a percentage of the Lower Explosive Limit (LEL). The instrument operates by the catalytic action of a heated platinum filament in contact with combustible gases. The filament is heated to operating temperature by passage of an electric current. When the gas sample contacts the heated filament, combustion on its surface raises the temperature in proportion to the quantity of combustibles in the sample. A Wheatstone bridge circuit, incorporating the filament as one arm, measures the change in electrical resistance due to the temperature increase. This change indicates the percentage of combustibles present in the sample.

A Draeger Colorimetric Tube consists of a glass tube impregnated with an indicating chemical. The tube is connected to a pump and a known volume of contaminated air is drawn through the tube at a predetermined rate. The contaminant reacts with the indicator chemical in the tube, producing a stain whose length is proportional to the contaminants' concentration.

3.0 Remedial Investigation Sampling

Gas sampling was performed as part of the Remedial Investigation on November 22 and December 12, 1983. Due to problems in quality control, vent sampling was repeated on June 4, 1984. The initial sampling was performed on 25 existing vents and was used to determine the most active vents for further, more extensive, testing. The approximate location of the vents are shown in Figure 1.

Each of the vents was screened with the OVA and Explosimeter. Vents with readings greater than 1000 ppm were additionally screened with the Colorimetric Indicator Tubes.

Each of the vents has a vent cap which was removed to allow the inlet port of the sampling device to be placed on top of the vent opening. In this manner samples were obtained of the vent gases at the exit point to the ambient air. In addition to analyzing the gas within the vents, the OVA was used to characterize concentrations in air immediately downwind of the vents.

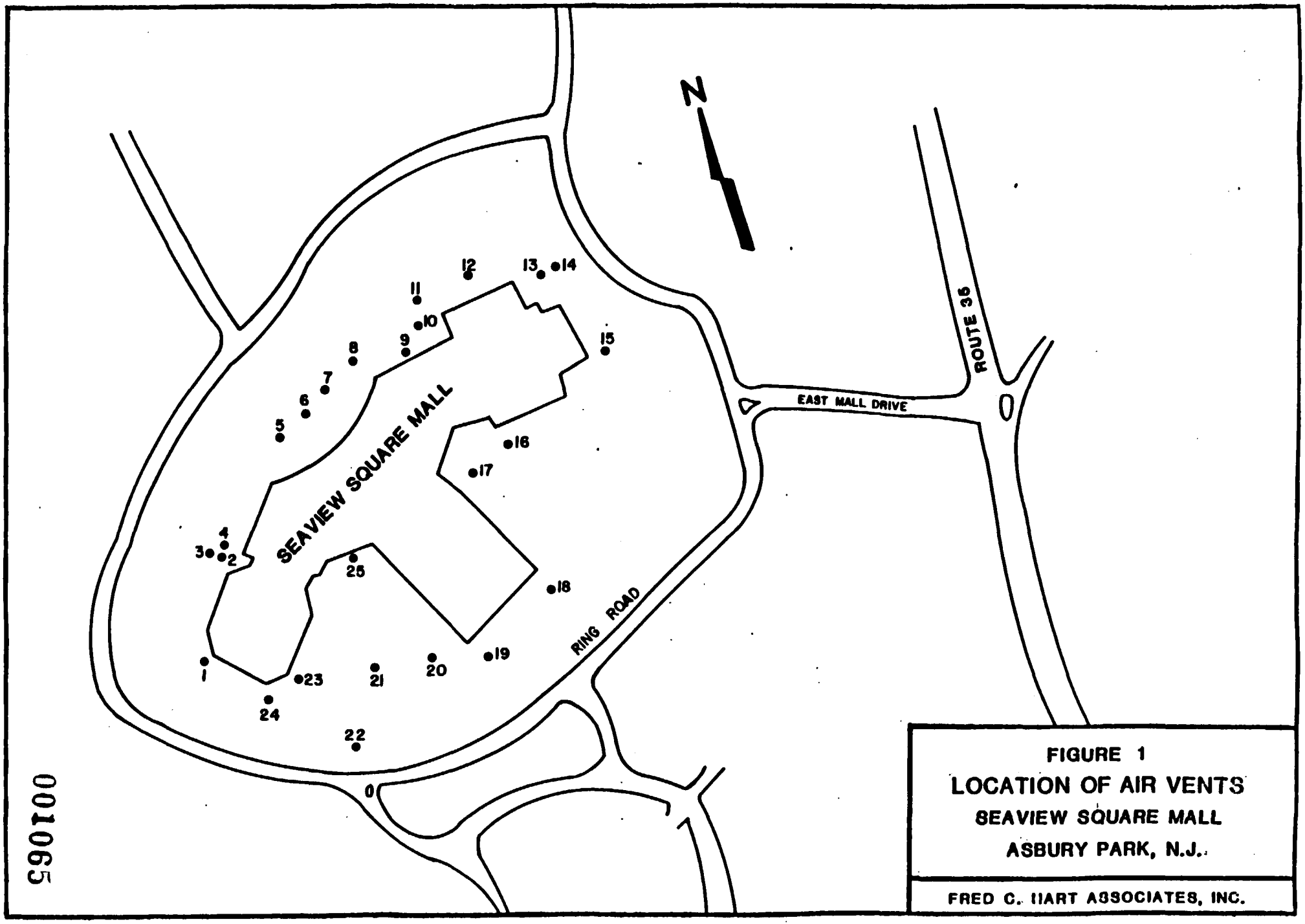

FIGURE 1
LOCATION OF AIR VENTS
SEAVIEW SQUARE MALL
ASBURY PARK, N.J.

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The results of the initial screening indicated that many of the vents had concentrations of less than 100 ppm of total hydrocarbons and no readings on the explosimeter. These vents were considered to be inactive. Most of the remaining vents had readings greater than 1000 ppm of total hydrocarbons and 100% of the Lower Explosive Limit (LEL).

Draeger tubes for vinyl chloride, toluene, trichloroethylene, and benzene were used on vents with a reading of greater than 1000 ppm of total organics. A potential trace of toluene was found at one vent and a possible trace of vinyl chloride was found at another (less than 1 ppm). Ambient air in a 10 to 12 foot radius around the vents was tested with the OVA. No concentrations above background levels were found within this radius. The only high readings detected with the OVA were found directly at the vent openings.

Based on the results of the preliminary screening, eleven (11) vents were selected for more extensive Gas Chromatography/Mass Spectrophotometry (GC/MS) analysis. A schematic of the sampling train is provided in Figure 2. Vents numbered V-2, V-3, V-4, V-6, V-10, V-12, V-15, V-17, V-20, and V-24 were sampled. Vent V-12 was sampled in triplicate and one background sample and one trip blank were collected. The sampling cylinders available from Princeton Testing Laboratory, varied in size, and therefore, the time the pumps were run also varied as follows:

Vent No.	Sample Bomb Size	Total Collection Time
V-2	300 cc	10 minutes
V-3	300	10
V-4	500	10
V-6	500	10
V-10	500	10
V-12	500	30
V-15	500	25
V-17	500	25
V-19	500	25
V-20	1,000	40
V-24	1,000	40
V-0 (background)	500	10
V-A (V-12)	500	30
V-B (V-12)	500	30
V-C (trip blank)	500	--

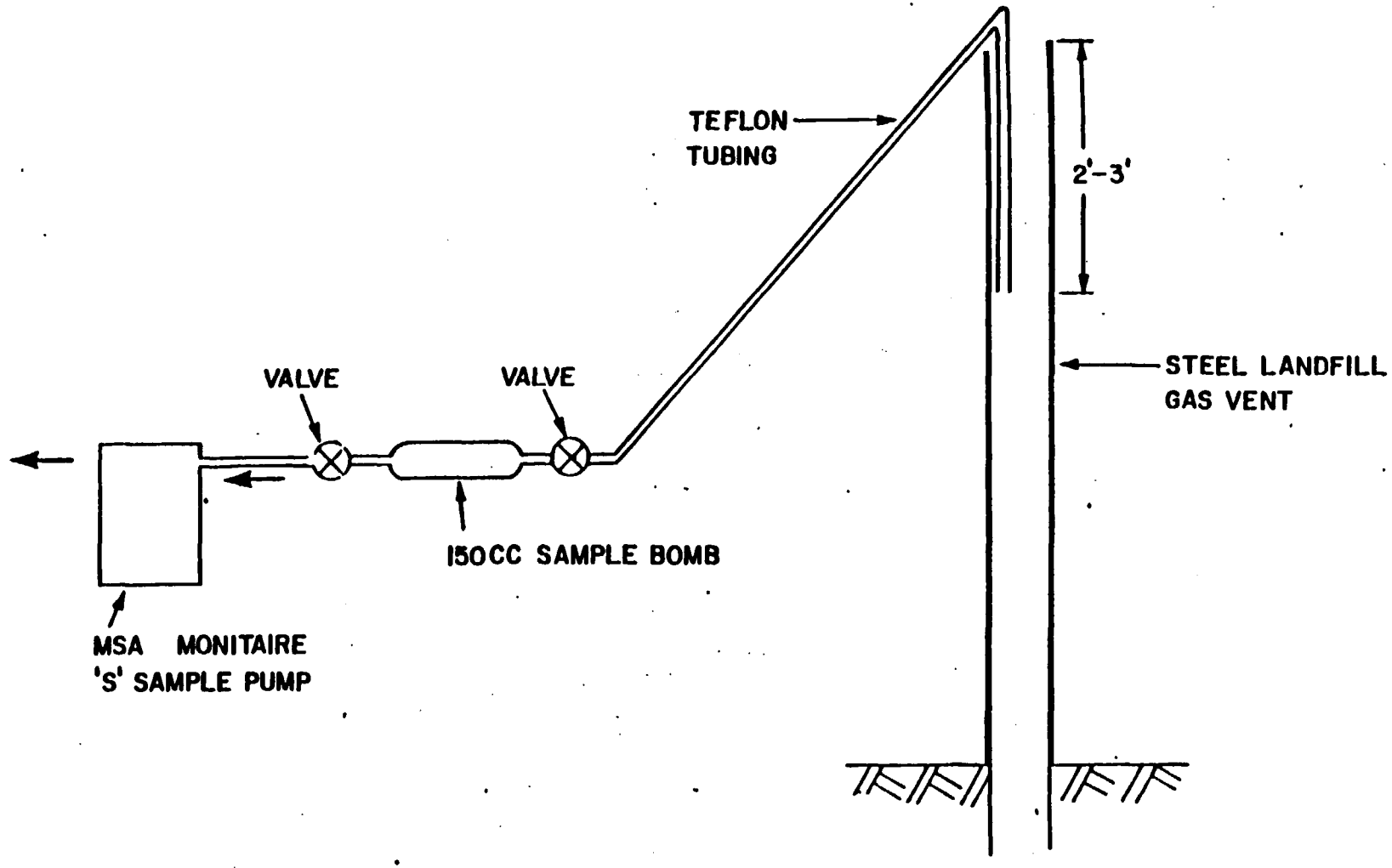

FIGURE 2

SCHEMATIC OF SAMPLING TRAIN FOR SEAVIEW SQUARE VENT SAMPLING PROGRAM

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Samples were collected by climbing an eight-foot ladder, taping the sampling pump and cylinder to the top rung to the ladder, removing the vent cap, and snaking 1/4-inch Teflon tubing attached to the stainless steel sampling cylinder three to four feet down inside the vent. The cylinder valves were opened and the pump run for the specified time. The valve closest to the pump was closed, the second valve was closed, and the pump was shut off. The cylinder was then removed from the sample train, labelled and stored in an insulated container at ambient temperature. The samples were brought to the lab at the end of the day. The sampling pump was calibrated at 2 ml/sec. The prevailing wind was westerly at 20-25 mph with gusts to 50 mph; weather was sunny; ambient temperature was 43°F.

The concentrations of priority pollutants, acetone and methane in the vents are provided in Table 1.

As can be seen in this table, methane concentrations greater than 1% were detected in 7 of the 11 vents sampled. Trace levels of priority pollutant organics were found in the vent samples, the trip blank and the background sample, generally at less than 1 ppm. This level was exceeded only in Vent #4 for toluene (1.1 ppm) and Dichlorofluoromethane (2.0 ppm). Vent #4 also had the highest methane concentration of 35 percent.

In addition to the methane and the priority pollutant organics, a number of other C_6-C_{11} hydrocarbons (mostly alkanes) were detected in the vents, as was acetone, which was used to clean the cylinders. The concentrations of these compounds were generally less than 1 ppm, with the exception of butane which was detected at 30 and 16 ppm in Vents #10 and #12, respectively. Many of these trace organics were found in similar concentrations in the trip blank and upwind background air sample.

The data indicates that quality control problems occurred with these samples. Almost all of the priority pollutant contaminants found in the vents were also found at similar concentrations in the unopened trip blank and in the upgradient ambient air sample. Further, triplicate precision was not high.

TABLE 1

SEAVIEW SQUARE MALL
PARTIAL SUMMARY OF VENT SAMPLING RESULTS
NOVEMBER 22, 1983
PRIORITY POLLUTANTS, ACETONE AND METHANE
(ppm)

Compound	Vent # C (Trip Blk)	0 (Bkgd)	2	3	4	6	10	12	A*	B*	15	17	19	20	24
Benzene	.04	0.12	.14	.08	.11	.08	LT .04	ND	.04	.01	.06	.01	ND	.02	.12
Chloroform	LT .01	ND	.25	ND	ND	.08	.04	.07	LT	.01	.01	ND	.02	ND	ND
Dichlorodifluoro Methane	ND	ND	ND	ND	2.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethyl Benzene	.02	.14	.10	.16	ND	.12	.09	.02	.07	.07	.02	.13	.02	.02	.48
Methylene Chloride	.01	.04	ND	LT .01	ND	.16	ND	.14	.05	LT .01	.06	.07	ND	ND	.44
Toluene	.15	.60	.69	.79	1.1	.53	.70	.77	.81	.24	.58	.41	.15	.10	.24
Acetone	0.2	.07	.31	.27	.42	.20	.56	.11	.34	.11	.43	.19	LT .01	.02	13
Methane (%)	LT 0.5	LT 0.5	2.4	19	35	3.3	3.3	26	27	20	8.9	LT 0.5	LT 0.5	LT 0.5	LT 0.5

* Vents 12, A, and B are triplicate samples.

LT = less than
ND = not detected

TABLE 2

SEAVIEW SQUARE MALL
VENT SAMPLING RESULTS
June 5, 1984
(ppm)

Compound	C (trip)	V-0 (bkgd)	V-2	V-3	V-4	V-5	V-6	V-12	V-A	V-8	V-15	V-17	V-18	V-19	V-21
Acetone	9.2	1.0	44	3!	150	190	80	6.8	41	67	9.9	21	0.50	0.12	5.3
Methylene Chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-dichloroethylene	ND	16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-dichloroethylene	ND	ND	ND	ND	ND	0.68	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-dichloroethane	ND	ND	ND	ND	ND	0.22	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	ND	ND	ND	ND	ND	ND	ND	0.83	0.18	ND	ND	ND	ND	.ND	ND
Toluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.03	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	0.27	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND	ND	0.20	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.04	ND	ND	ND	ND	ND
C_4H_8	ND	ND	0.19	ND	0.58	0.50	ND	0.75	0.72	ND	ND	0.22	ND	ND	ND
C_5H_{10}	ND	ND	ND	ND	ND	ND	ND	0.09	ND	ND	ND	ND	ND	ND	ND
C_5H_{12}	ND	ND	ND	ND	ND	ND	ND	0.34	ND	ND	ND	ND	0.62	ND	ND
C_6H_{14}	0.20	1.5	9.5	0.22	0.99	1.2	ND	1.9	0.26	ND	0.24	ND	0.09	ND	ND
C_7H_{14}	ND	ND	ND	ND	ND	1.2	ND		ND	ND	ND	ND	ND	ND	ND
C_7H_{16}	ND	ND	ND	ND	ND	0.19	ND	0.24	0.09	ND	ND	ND	ND	ND	ND
C_9H_{18}	ND	ND	ND	0.17	ND	ND	ND	ND	ND	0.26	ND	ND	ND	ND	ND
$C_{10}H_{20}$	ND	ND	ND	0.009	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
% LEL	NA	NA	+LEL	+LEL	+LEL	+LEL	+LEL	+UEL	NA	NA	+UEL	LEL	LEL	NA	+LEL

+LEL = greater than lower explosive limit
LEL = 100% of lower explosive limit
+UEL = greater than upper explosive limit
V-C = trip blank - unopened sample cylinder
V-0 = Background - upwind ambient air sample
NA = not analyzed
ND = not detected

Due to problems in quality control, vent sampling was repeated on June 5, 1984. Vents were pre-screened with an Explosimeter, and grab samples were collected using 150-cc stainless steel cylinders. Each of the cylinders was cleaned prior to use by Princeton Testing Lab. Samples were collected by pumping the vent gases through the cylinders at 2 ml/sec for 15 minutes a cylinder. The temperature during this sampling campaign was in the 70s, with winds from 5 to 10 mph.

The results of the second round of sampling are presented in Table 2. All of the vents sampled were at or above the LEL. No priority pollutant organics were detected in the vents above 1 ppm. The highest concentration detected was 0.83 ppm of benzene in Vent #12. However, triplicate precision for Vent #12 was not high. As indicated on the table, each of these priority pollutants was found in only one of the 11 vents sampled (not always the same vent).

In addition, other C_4-C_{10} hydrocarbons were detected. The highest value detected was 1.9 ppm of hexane found in Vent #12. However, 1.5 ppm of hexane was also detected in the background sample and 0.20 ppm was found in the trip blank. The upwind control sample was also found to contain 16 ppm of 1,2 dichloroethylene.

Acetone, which was used to clean the sample cylinders was detected up to 190 ppm in Vent #5. Since this compound was also detected in the control sample, these values are believed to be from contaminants present in the cylinders.

4.0 Phase I and Phase II Sampling

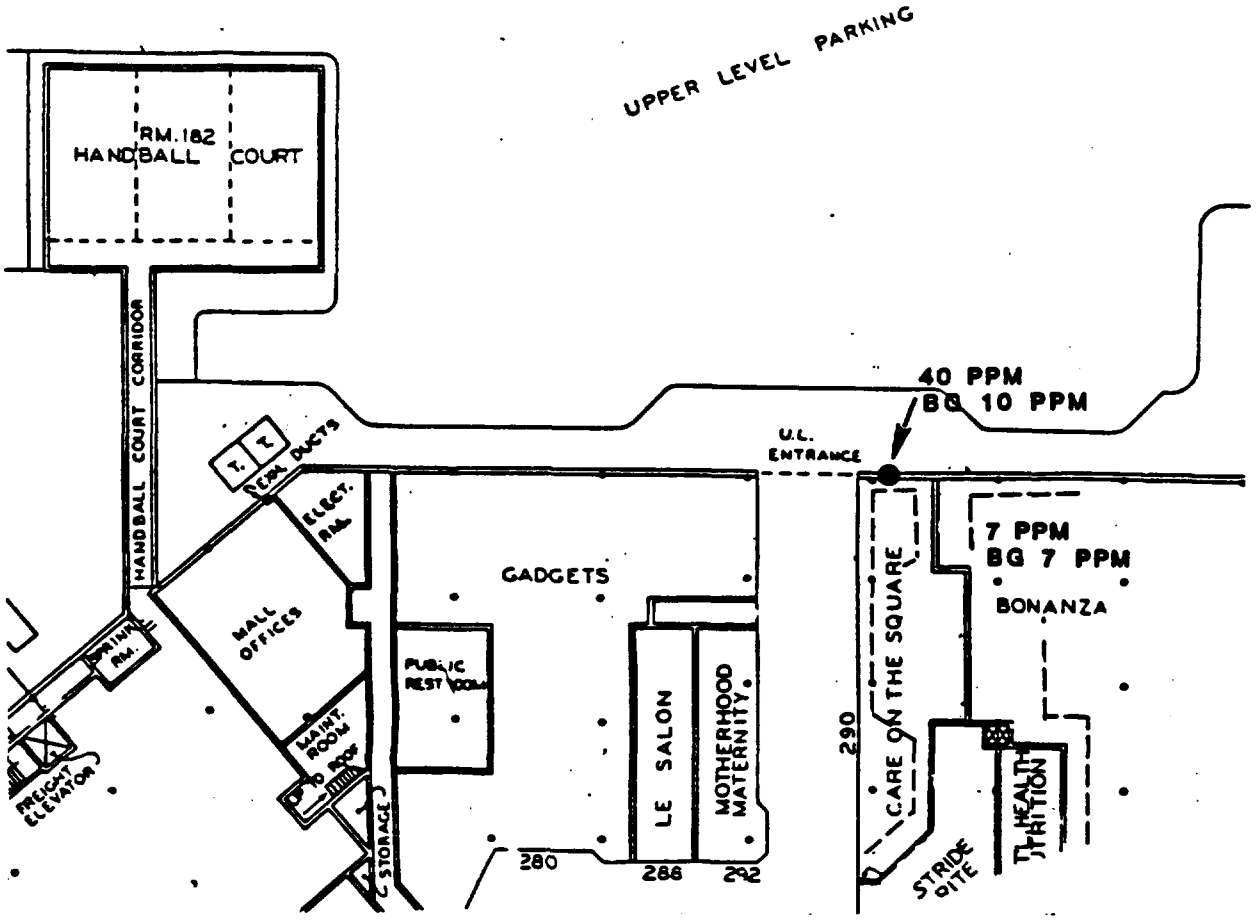
4.1 Indoor Air Sampling

Indoor air sampling was performed on October 1 and 10, 1984, and January 8, 1985. The survey was performed with an OVA and Explosimeter by monitoring the ambient conditions in empty rooms, electrical switch gear rooms, and in stores throughout the mall. The mall air ventilation system was turned off overnight to allow the accumulation of gases which might be migrating into the building. The ventilation system was not operated until sampling was complete. Background concentrations measured by the OVA were in some case up to 30ppm. These high background levels may have been due to valve contamination and readings indicated should analyzed relative to the background concentrations. Additional monitoring consisted of placing the instrument probe next to cracks, expansion joints, I-beams and other inconsistencies in the wall, floors and ceilings. The monitoring of these areas generally resulted in higher than background concentrations. On October 1, 1984, 22 rooms and 8 hallways were sampled. On October 10, 1984, samples were taken in the hallway behind rooms 184-186-192 and in the expansion joint in the northern side of the same hallway. On January 8, 1985, resampling was conducted to determine if the levels of LFG remained constant in the areas where LFG was found during the October 1, 1984, sampling.

LFG levels were found to be at zero or ambient in all the areas surveyed except the hallway behind B. Daltons (300 ppm), room 145 (0 - 1000 ppm), the expansion joints in the hallway behind rooms 184-186-192 (0-850 ppm), near the Rite Aid delivery door (10 - 50 ppm), and Care on the Square (2.5 - 40 ppm). The data are summarized in Appendix A and shown in Figures 3, 4, 5 and 6.

4.2 Perimeter Probe Sampling

A total of ten soil gas monitoring probes were installed at depths of two and five feet to monitor for LFG migration through the soils and clay barrier. The probes were installed at two elevations to determine if concentration varied at different levels. The perimeter probes were



---- AREA SAMPLED WITH OVA IN SURVEY MODE

BG BACKGROUND LEVEL

FIGURE 3
CARE ON THE SQUARE AND BONANZA LFG SAMPLING SEAVIEW SQUARE MALL ASBURY PARK, N.J.

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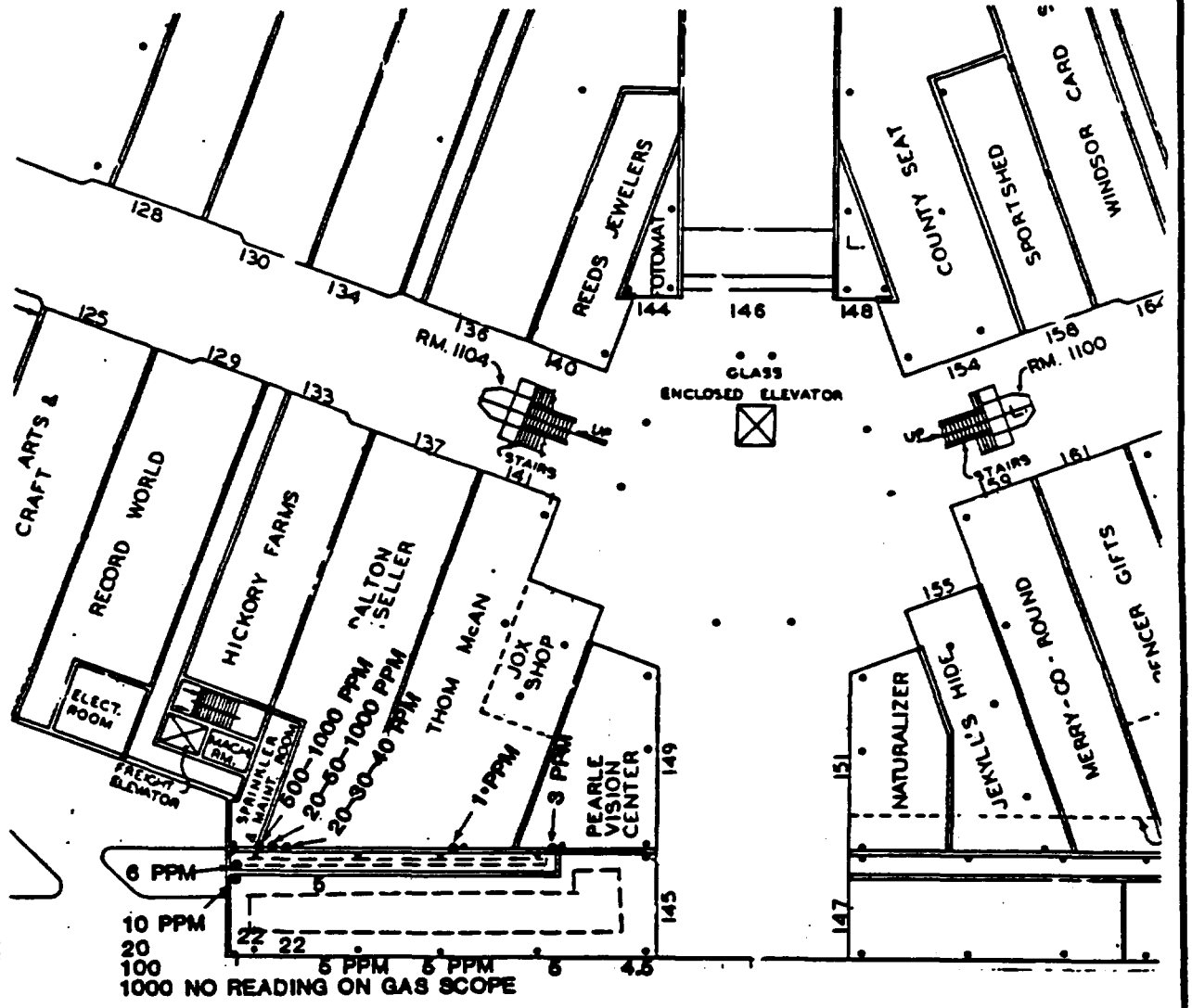

BACKGROUND READING WAS 0 PPM OUTSIDE STORE 147

_ _ _ _ _ _ _ AREA SAMPLED WITH OVA IN SURVEY MODE

FIGURE 4
STORE 145 AND HALLWAY LFG SAMPLING
10/1/84
SEAVIEW SQUARE MALL
ASBURY PARK, N.J.

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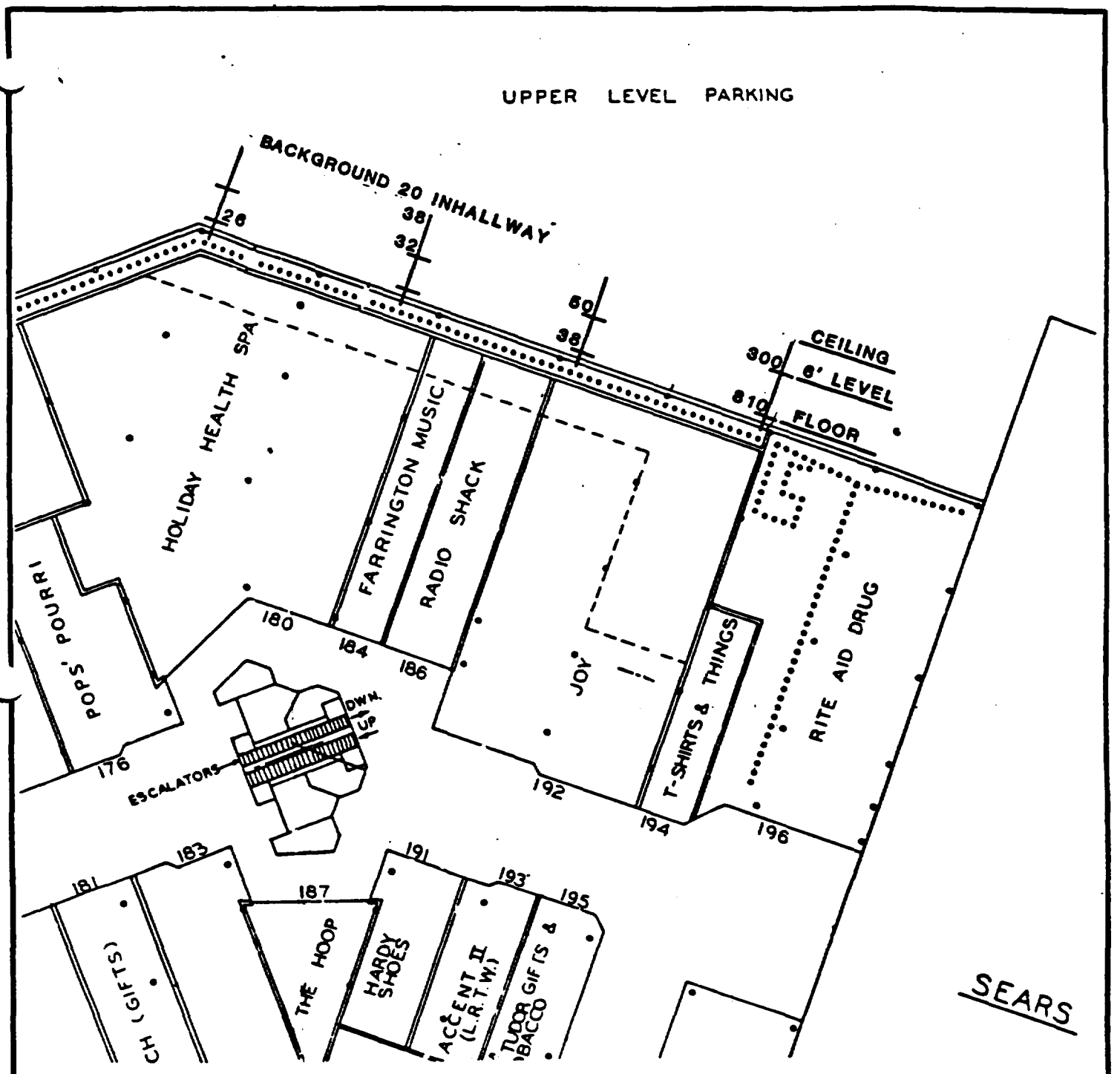

..... AREA SAMPLED WITH OVA IN SURVEY MODE

20 PPM BACKGROUND LEVEL

FIGURE 5

LOWER HALLWAY AND RITE AID DRUG

LFG SAMPLING 1/8/85

SEAVIEW SQUARE MALL

ASBURY PARK, N.J.

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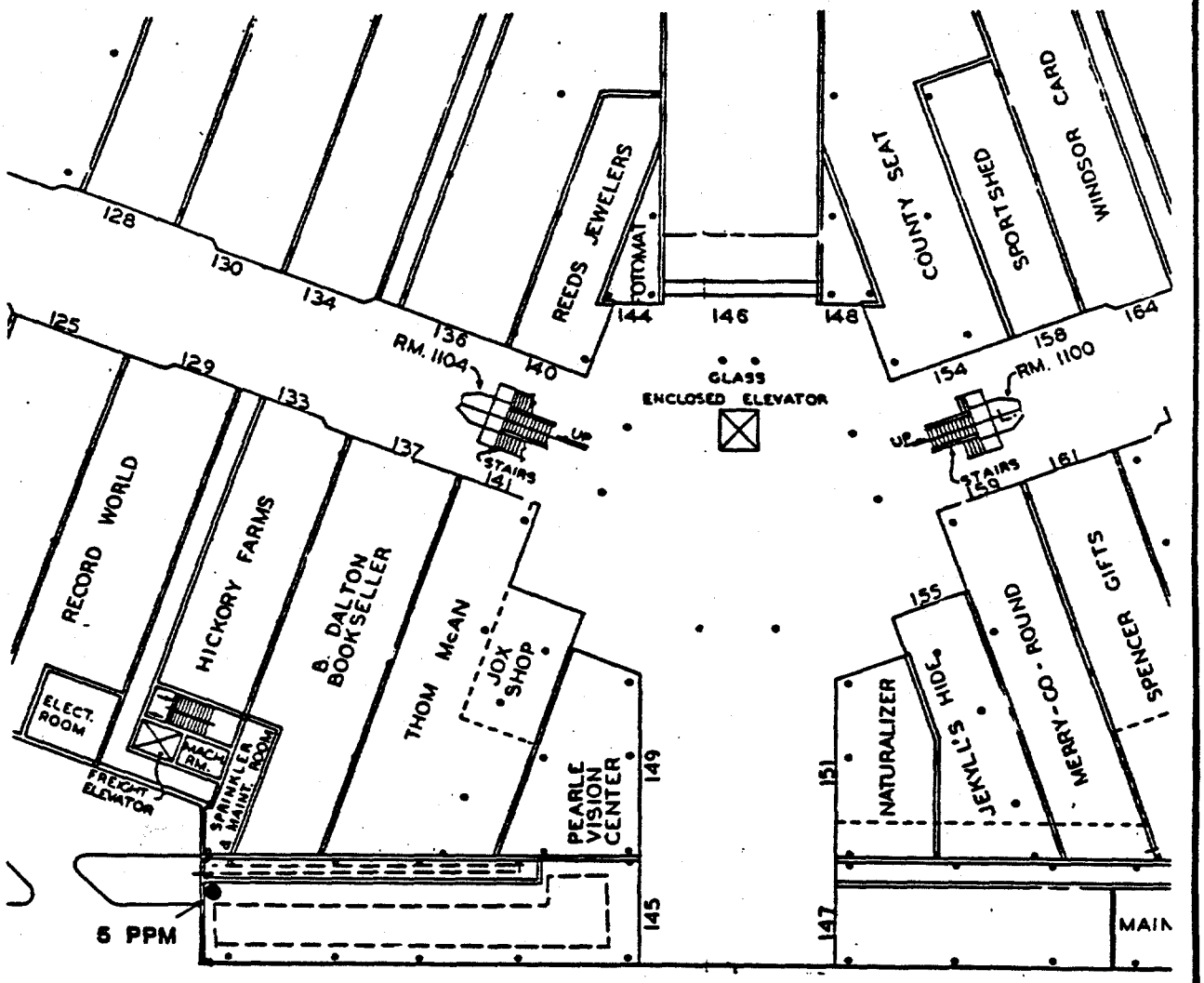

_____ AREA SAMPLED WITH OVA IN SURVEY MODE
BACKGROUND LEVELS 4.2 PPM

FIGURE 6

STORE 145 AND HALLWAY
LFG SAMPLING 1/8/85
SEAVIEW SQUARE MALL
ASBURY PARK, N.J.

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sampled on three different occasions. On October 11, 1984, the probes were sampled soon after installation. The data obtained on this date was disregarded due to the interference of the glue used to install the caps. Samples were taken again on November 7 and 9, 1984, and January 8 and 9, 1985.

All samples taken were at or near the background levels except for two: S-3 (near the Bonanza door) on 11/9/84 (1000 ppm) and S-8 east of Sterns on 11/9/84 (26 ppm).

The locations of these probes can be seen in Figure 7. The results are contained in Appendix B.

4.3 Pavement Subsurface Gas Sampling

On November 9, 1984, 43 subsurface soil gas samples were taken under the parking lot between the mall building and the underground clay barrier. These holes were sampled to determine the concentration and lateral extent of LFG migration in the underground area between the clay barrier and the mall buildings. The one-inch survey holes were made with a spike attached to an air hammer. The OVA probe was put into the hole and readings were taken in survey mode. The holes were then sealed with cement. The data is provided in Appendix B.

On January 9, 1985, eighteen air samples were taken under the asphalt within the sewer, water and power utility corridors leading from the mall to the off-site utilities. The sewer utility corridors drain east to west on the south side of the mall and run under Roller Road and the south and western sections of Ring Road, and finally discharge off-site into the main sewer trunk under NJS Route 35. Water enters the mall building near Stern's and Thom McAnn's and ultimately connects to the water main under NJS Route 66. JCP&L supplies electricity via overhead lines. Power cables run underground near the property perimeter to aboveground electrical transformers adjacent to mall buildings. Results of sampling are provided in Figure 8 and Appendix B.

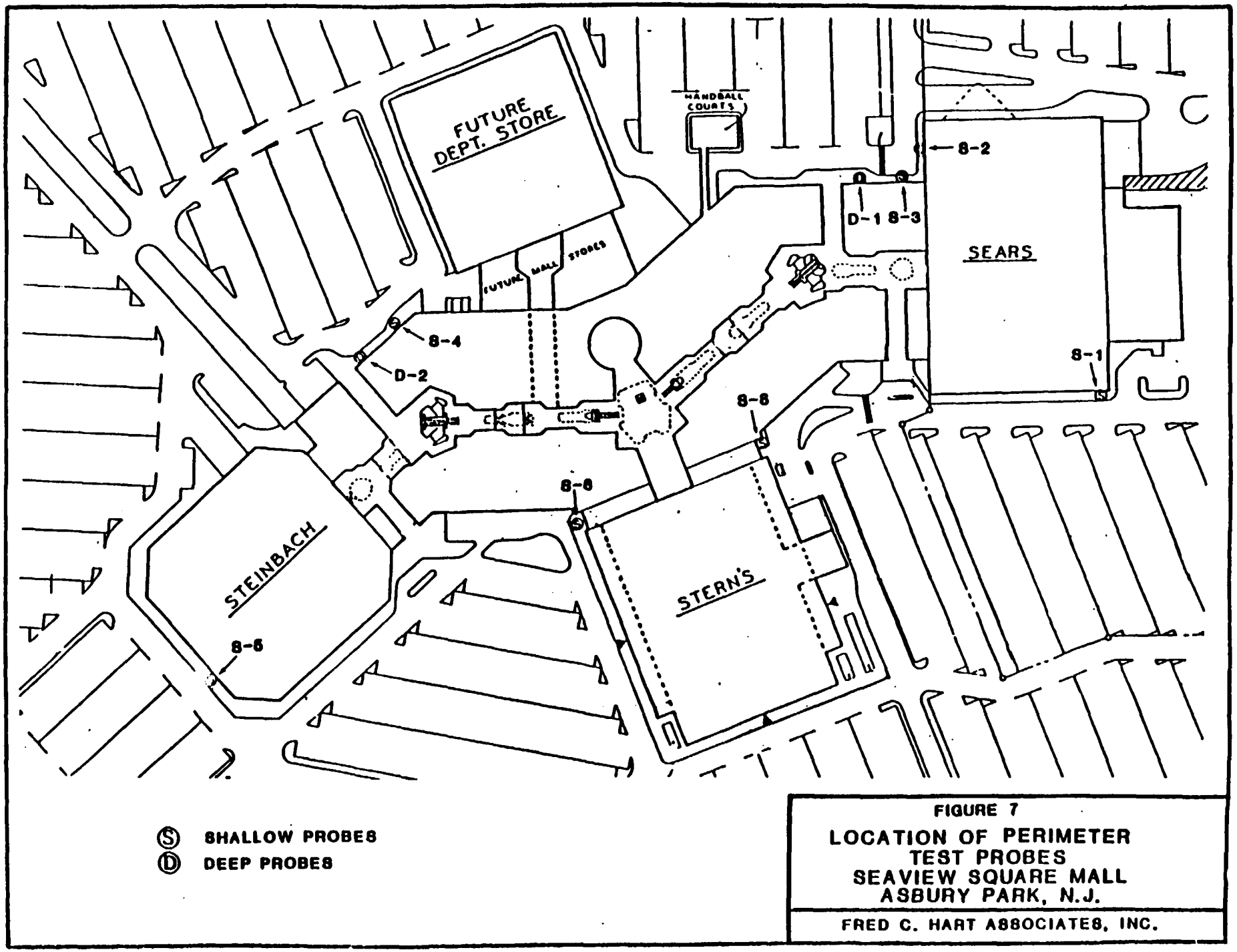

FIGURE 7

LOCATION OF PERIMETER TEST PROBES SEAVIEW SQUARE MALL ASBURY PARK, N.J.

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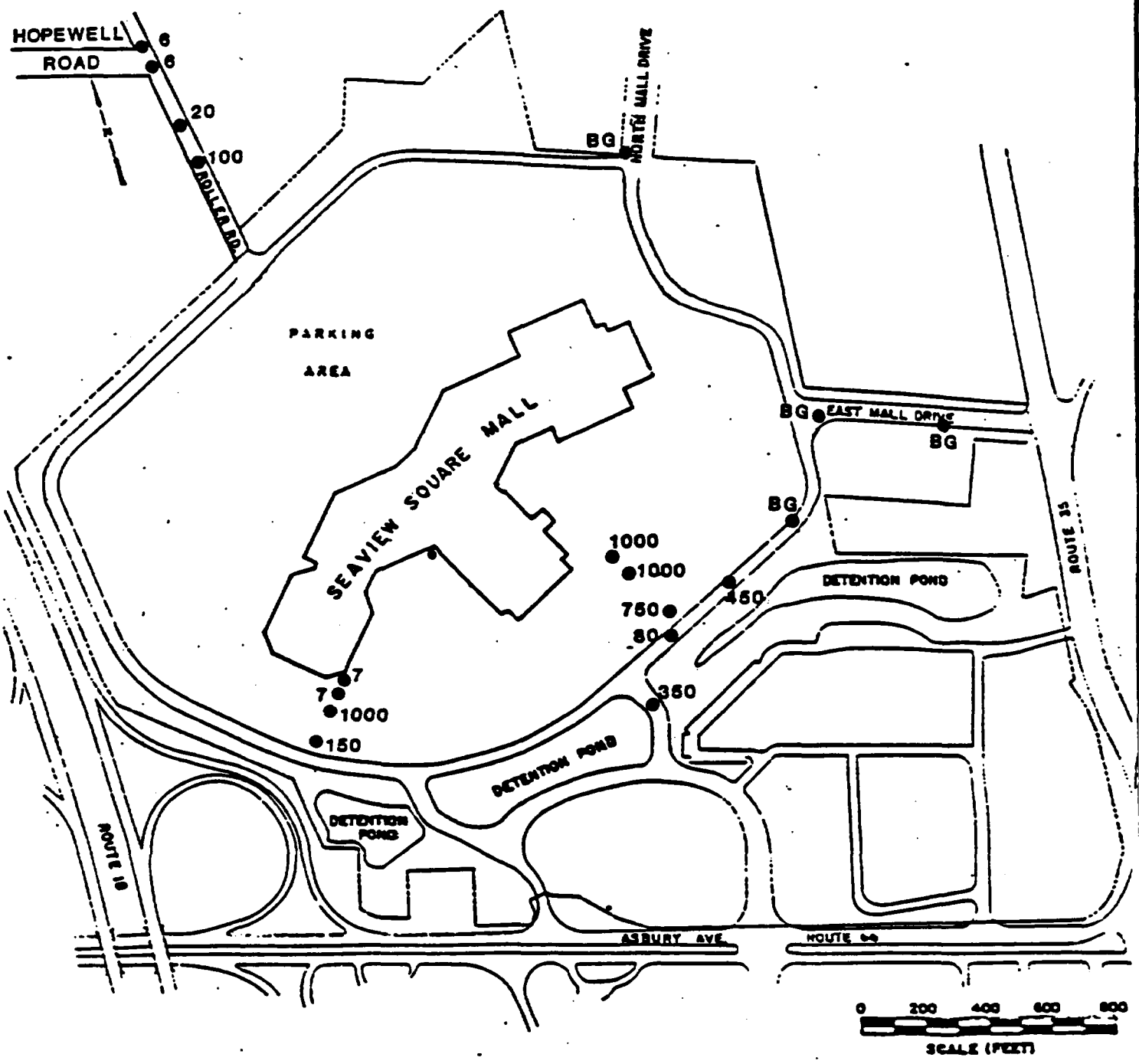

*BG - BACKGROUND LEVELS OF LFG
- ALL READINGS PPM

FIGURE 8
SUBSURFACE LFG SAMPLING
IN THE UTILITY CORRIDORS 1/9/85
SEAVIEW SQUARE MALL
ASBURY PARK, N.J.

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4.4 Utility Manhole Sampling

Manholes were surveyed during two different periods: November 7, 8, and 9, 1984, and January 7, 8, and 9, 1985. On November 7, 1984, JCP&L entered 11 manholes adjacent to the mall buildings and tested the air with an MSA Explosimeter (refer to Figure 9). Air samples were also taken with the OVA in survey mode by HART. Where manholes were flooded, JCP&L pumped the water out. Then they forced air into the manholes to vent the gases. After the manholes were vented JCP&L inspected the cables and the manhole structure.

On January 7, 8, and 9, all the power, sewer, leachate, and telephone manholes were sampled with the OVA in survey mode (refer to Figure 10). The OVA probe was placed in holes in the lid or underneath the lid. Of the four telephone manholes sampled, only one had a reading above background (12 ppm; background 10 ppm).

Four of the power manholes were sampled with the OVA in both the survey and GC modes. These manholes were selected because of their location and the high levels of LFG. The leachate storage tank was also sampled with the OVA in both the survey and GC modes to determine if priority pollutant organics were present in the leachate LFG.

Of the five manholes sampled with the OVA on GC mode, only one of 14 tests indicated that another gas in addition to methane was present. Based on the temperature of the column used and on retention time tables, a compound with the retention time of butane, ethane or propane was detected in the manhole.

Sanitary manholes located adjacent to the mall were sampled in November 1984 for the presence of LFG. All sanitary manholes located throughout the mall property were sampled in January 1985. Readings ranged from background to 110 ppm adjacent to the mall and from 35 to over 1000 ppm in the manholes located on Ring Road and in the parking lot (Refer to Appendices C and D).

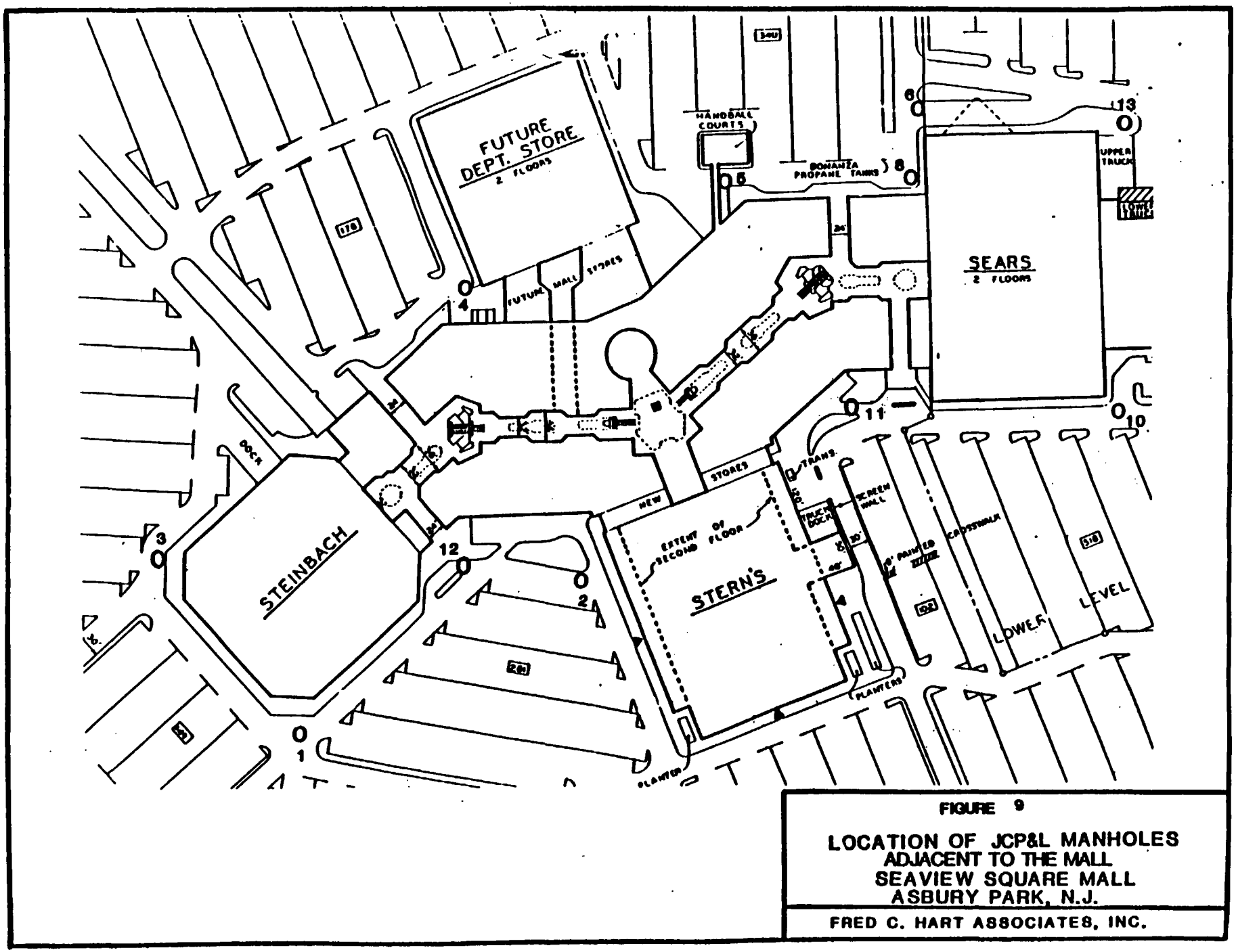

FIGURE 9

LOCATION OF JCP&L MANHOLES
ADJACENT TO THE MALL
SEAVIEW SQUARE MALL
ASBURY PARK, N.J.

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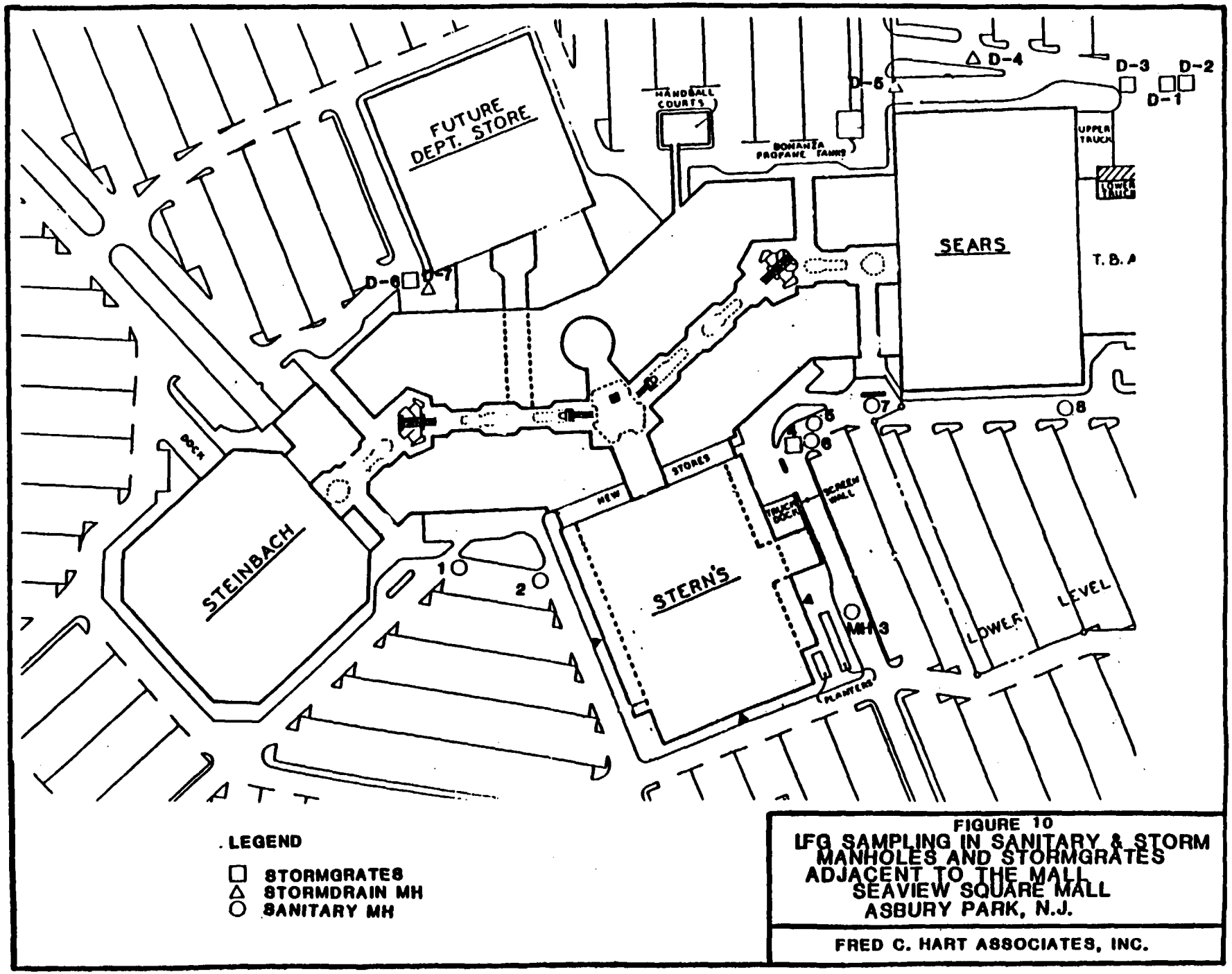

FIGURE 10
LFG SAMPLING IN SANITARY & STORM MANHOLES AND STORMGRATES ADJACENT TO THE MALL
SEAVIEW SQUARE MALL
ASBURY PARK, N.J.

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5.0 Phase III Sampling

5.1 Indoor Air Sampling

On July 9, and August 21, 22 and 29, 1985, indoor air sampling was conducted using the Organic Vapor Analyzer (OVA) in survey mode to determine the levels of LFG at locations where LFG had been detected on previous surveys.

Sampling locations and data for the July and August (1985) surveys are shown in Figures 11 through 15.

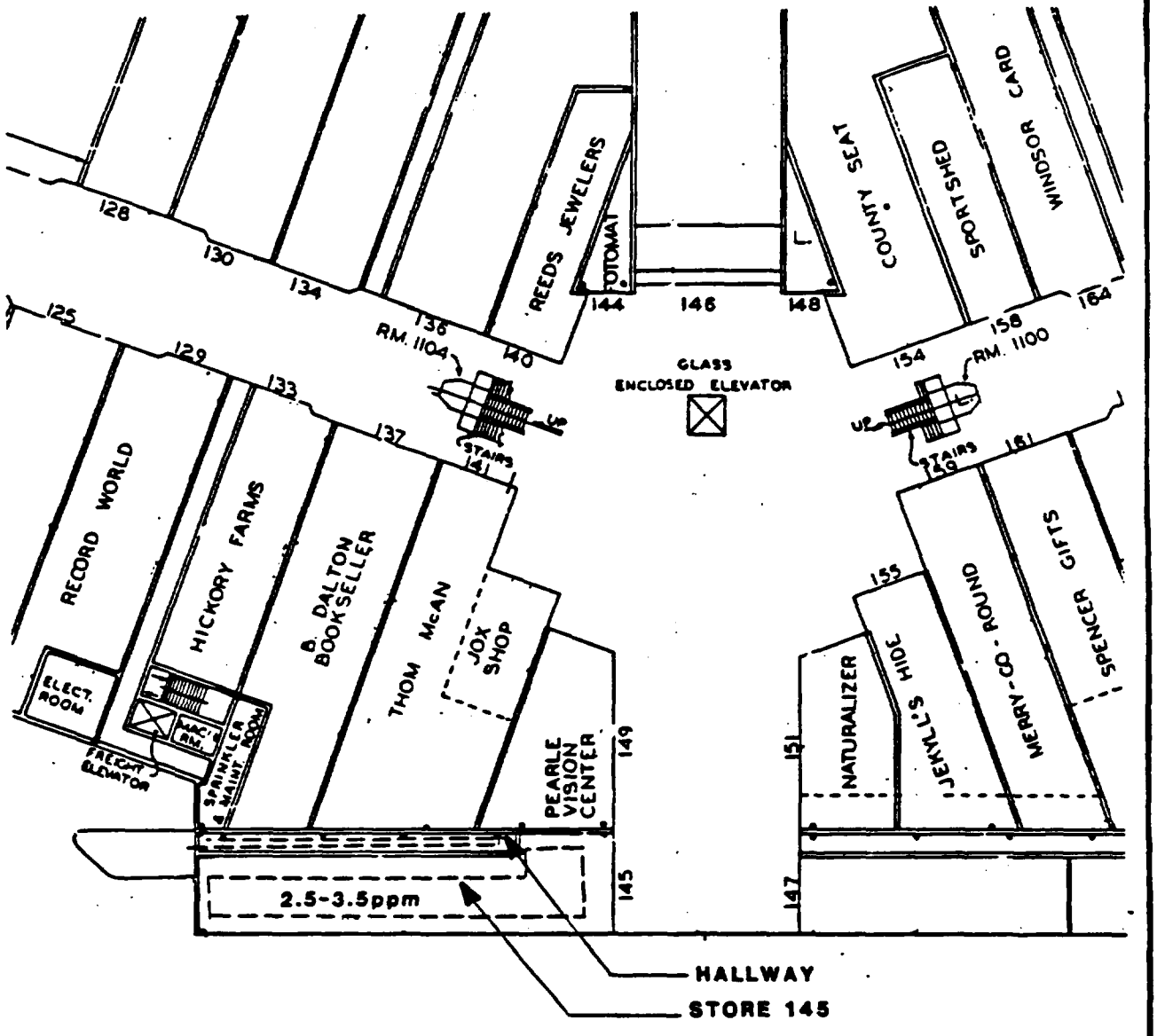
During the July and August surveys, LFG levels were found to be zero or ambient in all areas surveyed except: (1) the hallway adjacent to Store 145 and in Store 145 (see Figures 11, 12 and 13) and (2) the lower level hallway located behind stores #192 and #180 (see Figure 14). In addition, no LFG was detected in Care-on-the-Square (see Figure 15).

5.2 Perimeter Probes Adjacent to Mall Building

The perimeter probes were sampled with the OVA in survey mode on July 9, 1985 and August 29, 1985. Figure 6 provides the location of the probes and Table 3 provides the results of the sampling surveys; most of the OVA readings were at our near background levels. The highest OVA reading of 4.0 ppm above background was obtained at probe S-8, located east of Sterns. During the August 29 sampling survey, it was noted that probes D-2 and S-3 could not be located.

5.3 Manholes

The location of thirteen JCP&L manholes is shown on in Figure 9. They were surveyed on July 9 and August 20, 22, and 28. The sampling results are provided in Table 4.



---- AREA SAMPLED WITH OVA IN SURVEY MODE

FIGURE 11

STORE 145 AND HALLWAY
LFG SAMPLING 7/9/85
SEAVIEW SQUARE MALL
ASBURY PARK, N.J.

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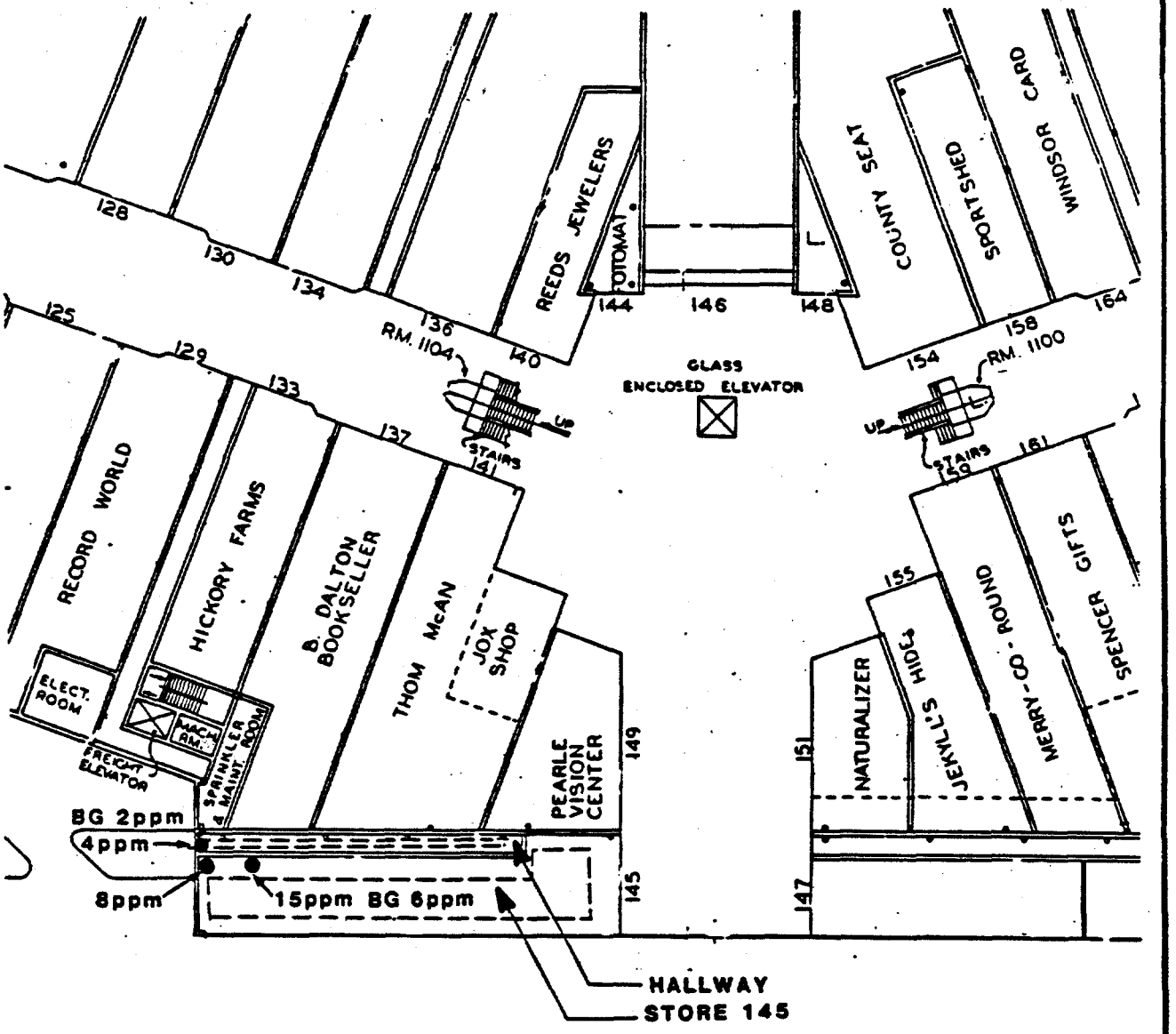

---- AREA SAMPLED WITH OVA IN SURVEY MODE

BG BACKGROUND LEVEL

FIGURE 12

STORE 145 AND HALLWAY
LFG SAMPLING 8/21/85
SEAVIEW SQUARE MALL
ASBURY PARK, N.J.

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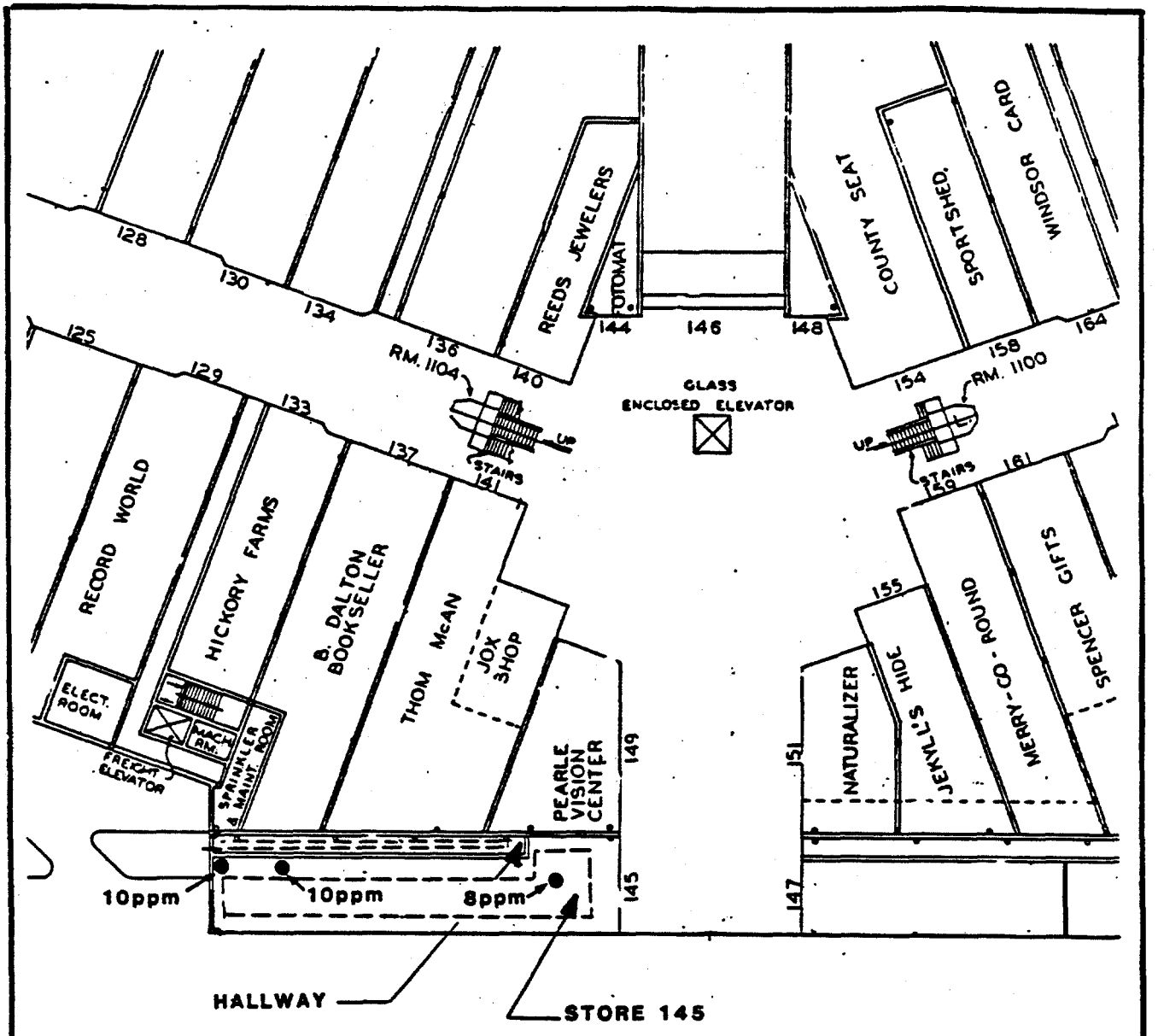

---- AREA SAMPLED WITH OVA IN SURVEY MODE
BACKGROUND LEVELS 4.0 ppm

FIGURE 13

STORE 145 AND HALLWAY
LFG SAMPLING 8/29/85
SEAVIEW SQUARE MALL
ASBURY PARK, N.J.

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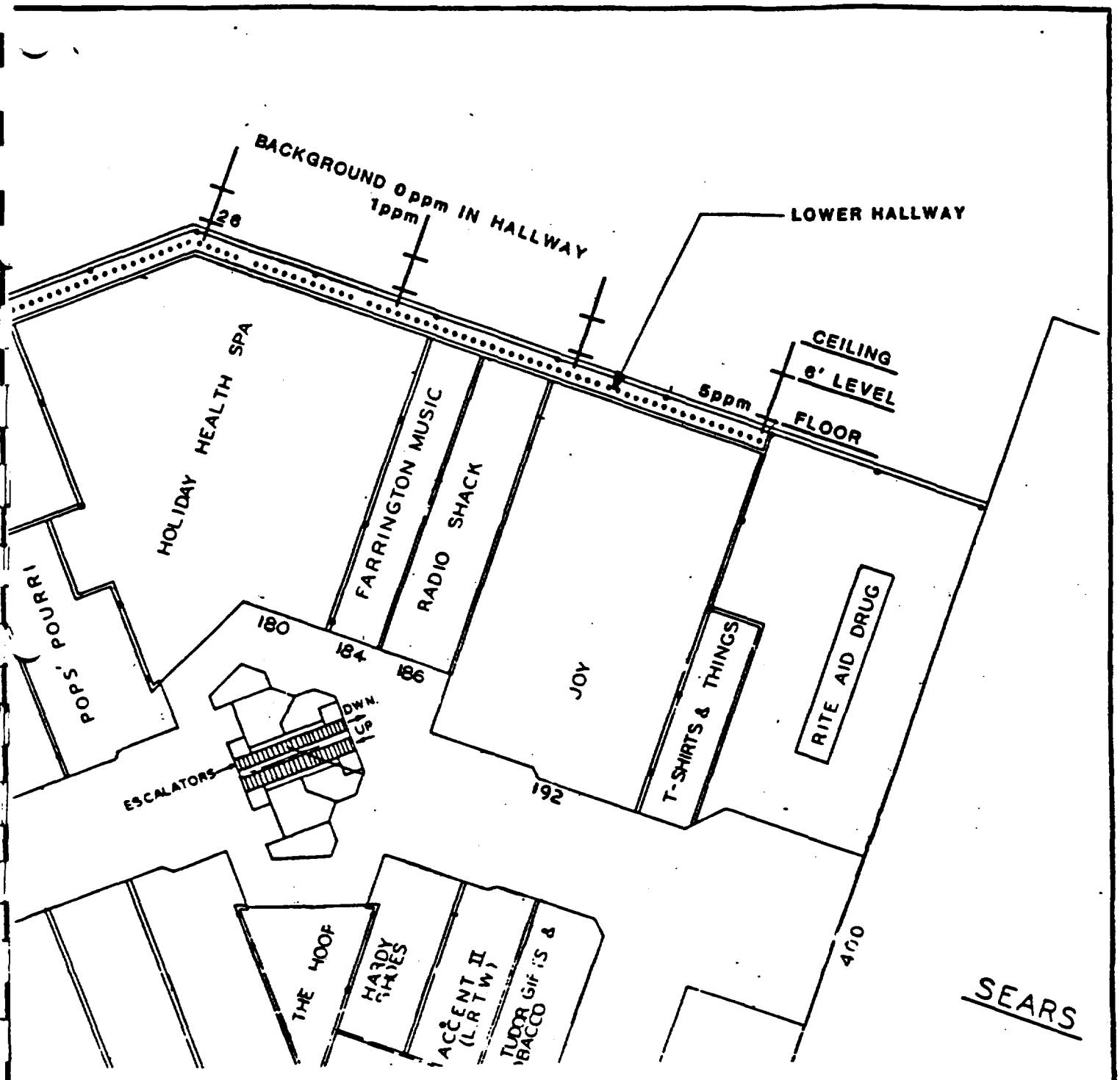

..... AREA SAMPLED WITH OVA IN SURVEY MODE

0 ppm BACKGROUND LEVEL (8/21/85)

No readings above background were obtained on the 7/9/85 survey.

FIGURE 14
LOWER HALLWAY AND RITE AID DRUG
LFG SAMPLING 7/9/85 & 8/21/85
SEAVIEW SQUARE MALL
ASBURY PARK, N.J.

FRED C. HART ASSOCIATES, INC.

001087

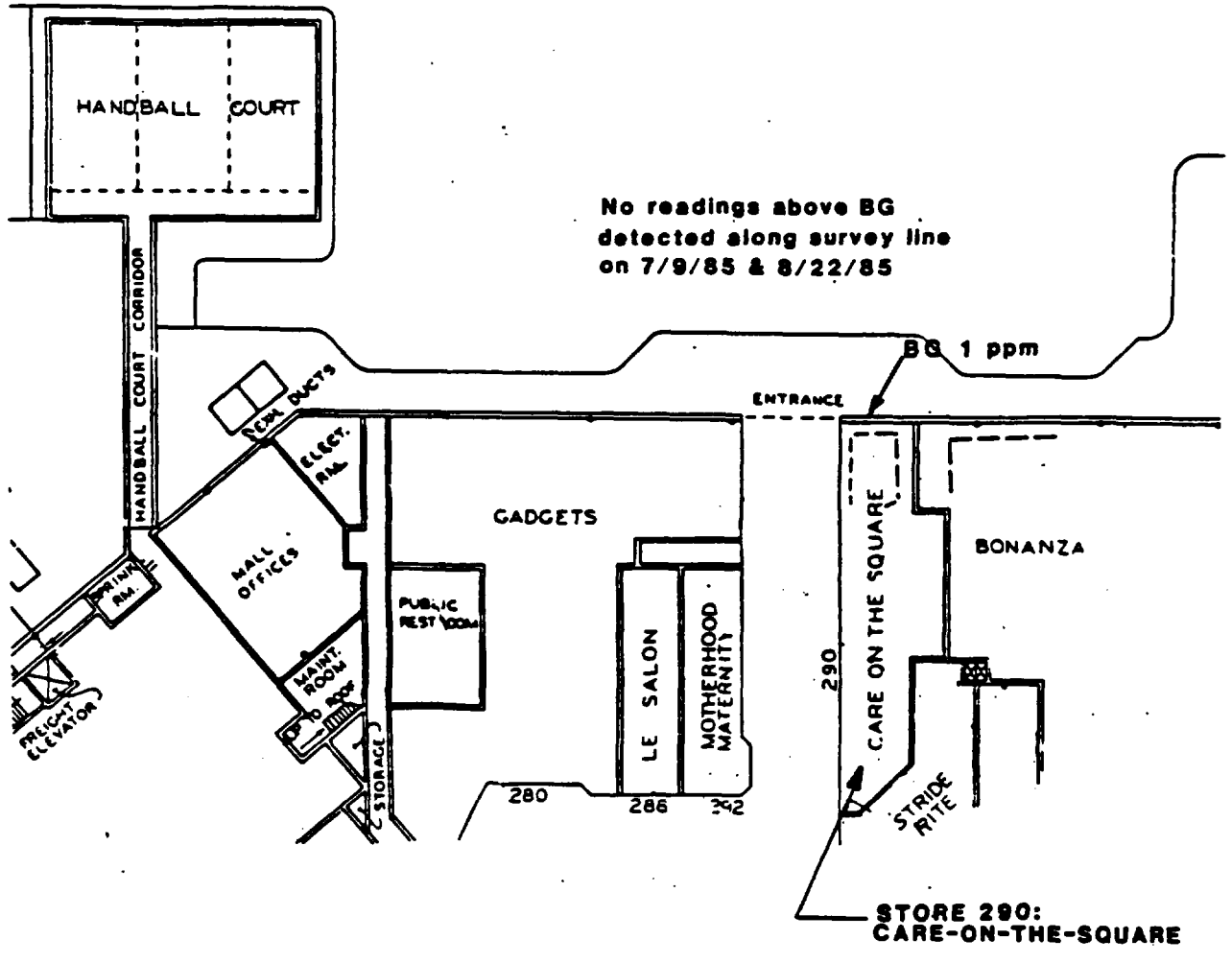

FIGURE 15
CARE ON THE SQUARE
LFG SAMPLING 7/9/85 & 8/22/85
SEAVIEW SQUARE MALL
ASBURY PARK, N.J.

FRED C. HART ASSOCIATES, INC.

001088

TABLE 3

READINGS IN PROBES ADJACENT TO THE MALL

Probe #	Locations	Date	PPM	Background	Date	PPM	Background
S-1	SE corner	11/7/84	6.4	6.4	7/9/85	3.0	3.0
	of Sears	11/9/84	6.4	5.8	8/29/85	1.0	1.0
		1/9/85	3.0	3.0			
S-2	W of Sears	11/7/84	7.8	8.0	7/9/85	3.0	3.0
		11/9/84	5.4	5.4	8/29/85	1.0	1.0
		1/9/85	3.0				
S-3	Near Bonanza	11/7/84	8.6	7.8	7/9/85	3.0	3.0
	Tanks	11/9/84	1000	5.4			
	Entrance	1/9/85	3.0	3.3			
D-1	Mall entrance	11/7/84	8.2	7.6	8/29/85	1.0	1.0
	near Bonanza	11/9/84	9.0	6.0			
		1/9/85	3.0	3.0			
S-4	E of NW	11/7/84	6.0	4.0	8/29/85	1.0	1.0
	Mall entrance	11/9/84	5.3	5.6			
		1/9/85	2.5	2.5			
D-2	W of NW	11/7/84	5.0	3.6	7/9/85	3.0	3.0
		11/9/84	5.8	5.6			
	Mall entrance	1/9/85	2.5	2.5			
S-5	W of Steinbach	11/7/84	5.0	4.0	7/9/85	3.0	3.0
		11/9/84	5.8	5.8	8/29/85	1.5	1.0
		1/9/85	2.5	2.5			
S-6	W of Sterns	11/7/84	5-6.0	4.0	7/9/85	3.0	3.0
		11/9/84	7.0	6.2	8/29/85	1.4	1.0
		1/9/85	2.5	2.5			
S-8	E of Sterns	11/7/84	3.4	2.0	7/9/85	3.0	3.0
		11/9/84	26.0	6.4	8/29/85	5.0	1.0
		1/9/85	2.5	2.5			

TABLE 4

SUMMARY OF READINGS
JCP&L MANHOLES LOCATED ADJACENT TO THE MALL

JCP & L Manhole #	(*)	Location	11/7/84 PPM	11/7/84 Background	11/7/84 % Explosive	1/7,8,9/85 PPM	1/7,8,9/85 Background	7/9/85 PPM	7/9/85 Background	8/20/85 PPM	8/20/85 Background	8/22/85 PPM	8/22/85 Background
1016	(1)	SW of Steinbach	1000	24	100	1000	2.5	1000	1	1000	3	1000**	1
1044	(2)	W of Sterns	30	30	-	7	3	-	-	40	7		
1020	(3)	NW of Steinbach	110	24	-	20	2.5	5	1	150	8	100**	1
1023	(4)	W of future site	26	26	-	-	-	1.0	1	3	3	1**	1
1027	(5)	E of future site	26	26	-	-	-	1.0	1	4	3	-	-
1029	(6)	NW of Sears, by Propane tanks	1000	24	5-10	78	3	70	1	1000	5	700	1
1032	(7)	NE of Sears on Ring Rd.	-	-	-	22	5	-	-	-	-	-	-
1028	(8)	W of Sears Near Bonanza Entrance	-	-	-	40	3	1.0	1	1000	5	450	1
1033	(9)	SE of Sears	7.6	6	-	110	3	-	-	-	-	-	-
1034	(10)	SE of Sears	120 275	7.6	-	150	0	950	1	-	-	700**	1
1035	(11)	E of Sterns	8.4	8.2	-	0	0	0.6	1	-	-	40	1
1017	(12)	SE of Steinbach	22	9.6	-	-	-	12	1	3	3	-	-
1030	(13)	NE of Sears	3.8	2.4	-	-	-	1	1	600	5	800	1

* SSM # for JCP&L Manholes
** Sampled on 8/28/85

On July 9, 1985, the JCP&L manholes were sampled with the OVA in survey mode. During this survey, LFG was detected at significant levels above background at manhole (MH) #1 (1,000 ppm), MH #6 (70 ppm) and MH #10 (950 ppm). On the August 20, 22, and 28 survey, LFG was detected at elevated concentrations in the following manholes: MH #1 (1,000 ppm), MH #2 (40 ppm), MH #3 (100-150 ppm), MH #6 (700-1,000 ppm), MH #8 (450-1,000 ppm), MH #10 (700 ppm), MH #11 (40 ppm) and MH #13 (600-800 ppm).

On August 28, 1985, six manholes with LFG concentrations greater than 100 ppm were sampled with the OVA in gas chromatograph (GC) mode to determine if non-methane hydrocarbons were present in the LFG. Of the six manholes sampled in GC mode, only MH #8 indicated that another gas in addition to the methane was present. Based on the temperature of the column and on retention times, it appears that the LFG at MH #8, located east of the propane tank pipeline, contains propane. In addition, the LFG at MH #13 showed several unidentifiable peaks with a retention time of greater than 2 minutes and a concentration of less than 10 ppm. These peaks may be present due to the fuel tank located adjacent to the manhole or may be a result of "noise" in the OVA. These manholes are in the area where a propane line had been previously damaged.

In addition to the power manholes, sanitary manholes located adjacent to the mall were sampled for the presence of LFG with the OVA in survey mode on July 9, 1985. Figure 10 provides the location of the sanitary manholes. The sampling results are presented in Table 5. Of the seven manholes, only MH #3 and MH #6 had elevated readings of LFG. MH #3 contained 90 ppm LFG, and MH #6 contained 440 ppm LFG.

TABLE 5

SUMMARY OF READINGS IN
NON-ELECTRICAL MANHOLES

Manhole #	Type	Location	11/8/84 PPM	11/8/84 Background	1/9/85 PPM	1/9/85 Background	7/9/85 PPM	7/9/85 Background
MH-1	San	Stern's & Steinbach	6.6	6.2	3.0	3.0	1.0	1.0
MH-2	San	W of Stern's	32	7.2	3.0	3.0	-	-
MH-3	-	In road E of Stern's	400	7.2	-	-	440	1.0
MH-4	-	S mall entrance by Sears	32	7.4	0	0	4.0	1.0
MH-5	-	E of Stern's hallway	50	7.4 (18*)	9.5	0	1.0	1.0
MH-6	Storm	S mall entrance between	7.8	7.8	12	0	90	1.0
MH-7	-	S mall entrance near Sears	42	8 (20*)	40	0	1.0	1.0
MH-8	San	SE corner of Sears	110	8	45	0	1.0	1.0
MH-9	Drainage	E of Sears by Auto Center	26	7.2	0	0	-	-

*Reading on the 10 scale

TABLE B-2

SUMMARY OF READINGS
IN UTILITY CORRIDORS
9/10/84

Identification	Location	PPM	Background
UCP-1	In front of mall, next to test pit	22	7
UCP-2	Near site in front of utility liners, left off corner of island	200	7.4
UCP-3	Adjacent to sprinkler and maintenance room, 3 ft from Thom McAnn corridor door	8.6	7.6
UCP-4	10 ft in front of utility corridor service entrance door	9.2	7.2
UCP-5	West of Stern's entrance, adjacent to pavement	7.8	7.4
UCP-6	30 ft from entrance to Stern's	7.4	7.2
UCP-7	E. corner of Stern's, 2 ft off pavement	1,000	7.6
UCP-8	15 ft from UCP-7 in middle of road	1,000	7.2
UCP-9	Island in SE corner of Stern's in vegefarm, 50 ft from E side entrance doors	7	7
UCP-10	SE corner of island	6.8	6.8
UCP-11	Corner of loading bay, at Stern's outer wall of truck lot	9.6	6.6
UCP-12	Next to building in truck loading area	6.4	6.4
UCP-13	In front of island, W of mall entrance between Stern's and Sears	110	3

TABLE B-2

SUMMARY OF READINGS
IN UTILITY CORRIDORS
9/10/84
(Continued)

Identification	Location	PPM	Background
UCP-14	15 ft. from pavement, 30 ft from mall entrance	300	3.6
UCP-15	Behind pavement directly behind UCP-14	4.8	3.8
UCP-16	30 ft. from bldg., 10 ft from pavement by mall entrance	5.2	4.2
UCP-17	5 ft from wall in line with UCP-16	5	4.2
UCP-18	Adjacent to pavement in front next to mall doors	100	4.4
UCP-19	In front of mall entrance, 15 ft. out	7.2	4.6
UCP-20	Middle of road, 20 ft. out from UPC-19	1,000	.5
UCP-21	20 ft. from curb W of Sear's door	1,000	5.2
UPC-22	Next to curb W of Sear's door	5.6	5.2
UPC-23	Soil cement trucker, just into sand	100	5.6
UPC-24	Next to curb	3.6	3.2
UCP-25	Farthest out from E corner of Sears	60-100	3.2

TABLE B-2

SUMMARY OF READINGS
IN UTILITY CORRIDORS
9/10/84
(Continued)

Identification	Location	PPM	Background
UCP-26		1,000	3.4
UCP-27	Next to curb	5	4.2
UCP-28	Across from hydrant, side entrance to Sears	8	4.2
UCP-29	Parking lot corner	8	4.2
UCP-30	In front of pavement E side of Sears in rear	20	5
UCP-31		6.6	5.6
UCP-32	By MH near propane tanks	1,000	4.2
UCP-33	Across from service door at Bonanza	1,000	6
UCP-34	Across from Bonanza entrance	7	5.8
UCP-35		5.4	5.2
UCP-36		5.2	5.2
UCP-37		6.4	5.2
UCP-38		6.0	5.4
UCP-39		6.2	5.8
UCP-40		6.6	5.8
UCP-41		7.2	5.8
UCP-42		5.8	5.8

APPENDIX A

INDOOR AIR SAMPLING

1/10/84, 1/11/84, 8/1/85

TABLE A-1

INDOOR LFG AIR SAMPLING

	1/10/84	1/11/84	8/1/85
Room 116 (Added Touch)	Ambient (1 ppm)		
Room 147 (Just Zappers)	Ambient		
Electrical Room #1			
Sprinkler Room #1	Ambient		Background 4.2
Hallway behind Room 137 - 141 (B Daltons)	300 ppm near doorway floor		Background 7.4 - 7.5
Room 145 (unfinished store) (dirt floor)	Background to 1000		
Room 134	0		
Room 105	0		
Hallway Behind Room 108 and 102	0		
Main Hallway Near Steinbach's	0		
Room 100	1 ppm near Ibeam 30' from entrance		
Main Hallway from Steinbach's Room 163 (Fayva)	0		
Sprinkler Room #4	0		
Electrical Rm #4	0		
Hallway between Room 163 and 171	0		
Hallway between Rooms 168 and 164	.5 ppm		
Hallway behind 172, 180, 184, 186, 192	0.5 ppm near spa near Rite Aid 1 ppm		20 back-ground (paint street)

TABLE A-1 (Continued)

	1/10/84	1/11/84	8/1/85
Rite Aid Drug delivery door	1.2 ppm 2.0 ppm at sanitary line	10 50	Bg Bg
Expansion joint near Rite Aid Drug delivery door	80 to 300 ppm	5 above background	810 floor to 300 mid way up wall
Expansion joints in hallway			
Station Number			
50+00	2 ppm		38-50-38
75+00	0		
85+00	2		
100+00	1-2		32 midway
105+00	1		
Corner	1		
Outside Room 290 (Care on the Square)	1-2		
Bathroom near rear wall	2.5		Bg 10 ppm
Rear wall	4 - 8 ppm		40 ppm
Tom McAnn			
Emergency door			
By bathroom			
Just Zippers Hallway	0		
Storm-Sanitary Lines	0		
Room 161 (Spencer Gifts)	0 ppm		
Entrance way door 10 feet from doorway	1 - 2 ppm		
Maintenance Rm	1-2		
Room 149 (Pearl Vision)	0		
Bathroom	1 ppm		
Office	1.0 - 1.2 ppm		
Room 137 (B. Dalton) backroom	1 1/2 ppm		
bathroom	2 ppm		
In front of doorway	1/2 ppm		
Room 129 (Record World)	0		

TABLE A-1 (Continued)

	1/10/84	1/11/84	8/1/85
Hallway from Room 129 to 120 (So-Fro Fabrics)	0		
Sprinkler Room #2 Upper level Hallway	0		
Transformer room #2	1/2 ppm		
Room 298			
Entrance to Bonanza	1/2 ppm		Back-
Game Room	1/2 to 1 ppm		ground 7
Storage Room	1/2 to 1 ppm		
Entrance	1 ppm		
Jack Lalane			
Racquet Ball Court	0		

APPENDIX B

OUTDOOR AIR SAMPLING IN PROBES AND UNDERGROUND UTILITY CORRIDORS LOCATED ADJACENT TO THE MALL

TABLE B-1

READINGS IN PROBES ADJACENT TO THE MALL

Probe #	Location	Date	PPM	Background
S-1	SE corner of Sears	11/7/84	6.4	6.4
		11/9/84	6.4	5.8
		1/9/85	3.0	3.0
S-2	W of Sears	11/7/84	7.8	8
		11/9/84	5.4	5.4
		1/9/85	3.0	3.0
S-3	Near Bonanza Tanks Entrance	11/7/84	8.6	7.8
		11/9/84	1000	5.4
		1/9/85	3.0	3.3
D-1	Mall entrance near Bonanza	11/7/84	8.2	7.6
		11/9/84	9	6
		1/9/85	3.0	3.0
S-4	E of NW Mall entrance	11/7/84	6	4
		11/9/84	5.3	5.6
		1/9/85	2.5	2.5
D-2	W of NW Mall entrance	11/7/84	5	3.6
		11/9/84	5.8	5.6
		1/9/85	2.5	2.5
S-5	W of Steinbach	11/7/84	5	4
		11/9/84	5.8	5.8
		1/9/85	2.5	2.5
S-6	W of Sterns	11/7/84	5-6	4
		11/9/84	7	6.2
		1/9/85	2.5	2.5
S-8	E of Sterns	11/7/84	3.4	2
		11/9/84	25	6.4
		1/9/85	2.5	2.5

APPENDIX C

AIR SAMPLING IN MANHOLES AND STORM DRAINS LOCATED ADJACENT TO THE MALL
11/7/84

TABLE C-1

SUMMARY OF READINGS
JCP&L MANHOLES LOCATED ADJACENT TO THE MALL
11/7/84

JCP&L Manhole #	(*)	Location	PPM	Background	% Explosive
1033	(9)	SE of Sears	7.6	6	--
1034	(10)	SE of Sears	120 275	7.6	--
1030	(13)	NE of Sears	3.8	2.4	--
1029	(6)	NW of Sears, by Propane Tanks	1,000	24	5-10%
1027	(5)	E of future site	26	26	--
1023	(4)	W of future site	26	26	--
1020	(3)	NW of Steinbach	110	24	--
1016	(1)	SW of Steinbach	1,000	24	100
1017	(12)	SE of Steinbach	22	9.6	--
1044	(2)	W of Sterns	30	30	--
1035	(11)	E of Sterns	8.4	8.2	--

* FCHA # for JCP&L Manholes

TABLE C-2

SUMMARY OF READINGS IN
NON-ELECTRICAL MANHOLES
11/8/84

JCP&L Manhole #	Type	Location	PPM	Background
MH-1	San	Stern's & Steinbach	6.6	6.2
MH-2	San	W of Stern's	32	7.2
MH-3	-	In road E of Stern's	400	7.2
MH-4	-	S mall entrance by Sears	32	7.4
MH-5		E of Stern's hallway	50	7.4 (18*)
MH-6	Storm	S mall entrance between Stern's & Sears	7.8	7.8
MH-7	-	S mall entrance near Sears	42	8 (20*)
MH-8	San	SE corner of Sears	110	8
MH-9	Drainage	E of Sears by Auto Center	26	7.2

* Reading on the 10 scale

TABLE C-3

SUMMARY OF READINGS
FROM STORM DRAINS
11/8/84

Drain #	Location	PPM	Background
SD-1	NE of Sears in access road	--	--
SD-2	Next to SD-1	110	22
SD-3	NE of Sears	100	22
SD-4	N of Sears at entrance	700	22
SD-5	NW corner of Sears near Propane Tanks	40	26
SD-6	E of future site	22	22
SD-7	Near SD-6	22	22

APPENDIX D
SUMMARY OF READINGS OF PERIMETER POINTS LOCATED NEAR RING ROAD AND EAST MALL DRIVE
11/9/84

TABLE D-1

SUMMARY OF READINGS
OF PERIMETER POINTS LOCATED NEAR
RING ROAD AND EAST MALL DRIVE
11/9/84

Sampling Point #	Location	PPM	Background
OSP-1	E side of mall, adjacent to access road from 35N, next to monitoring well #3	5.6	5.8
OSP-2	10 ft. from corner of Renault pavement (swampy area)	200	5.6
OSP-3	10 ft. from back lot and 10 ft. from 2nd light pole	5.2	5.4
OSP-4	20 ft. from toe, 60 ft. from back lot	1,000	5,4
OSP-5	N side of road separating Renault from Ford	5.8	5.8
OSP-6	15 ft. from toe, 50 yds from SP1 in line	5.6	5.6
OSP-7	On top of fill, 30 yds from OSP-6	6.2	5.6